| Centre Number | Candidate Number |
|---|---|
| | |

Candidate Name _____

**International General Certificate of Secondary Education**
**UNIVERSITY OF CAMBRIDGE LOCAL EXAMINATIONS SYNDICATE**

# PHYSICS 0625/6

PAPER 6 Alternative to Practical

**MAY/JUNE SESSION 2000** 1 hour

Candidates answer on the question paper.
Additional materials:
Electronic calculator and/or Mathematical tables
Protractor
Ruler (30 cm)

**TIME** 1 hour

**INSTRUCTIONS TO CANDIDATES**

Write your name, Centre number and candidate number in the spaces at the top of this page.
Answer **all** questions.
Write your answers in the spaces provided on the question paper.

**INFORMATION FOR CANDIDATES**

The number of marks is given in brackets [ ] at the end of each question or part question.
You may use a calculator.

| FOR EXAMINER'S USE | |
|---|---|
| 1 | |
| 2 | |
| 3 | |
| 4 | |
| 5 | |
| TOTAL | |

**This question paper consists of 11 printed pages and 1 blank page.**



**[Turn over**

**1** Fig. 1.1 represents the apparatus an IGCSE class is using for an optics experiment, in which a glass beaker filled with water acts like a lens.

The glass beaker filled with water is placed with C, the centre of its base, on a line labelled LL'. An optics pin is placed at the point labelled O, so that the pin is touching the side of the beaker.

Two points A and A' are on the surface of the beaker at equal distances from the line LL'. The pin at point O acts as an optical object. The ray emerging from A is located by using two pins placed at two points labelled $P_1$ and $P_2$.

**(a)** Draw a neat, thin and accurate line to show the path of the ray from O to A in the water. Complete the path, in air, of the emerging ray along $AP_1P_2$. [3]

**(b)** Produce the line $P_2P_1A$ backwards so as to cut the line LL'. Label, with the letter I, the point where the two lines cross. Point I is the position of the image of the pin O when it is touching the side of the beaker. [2]

**(c)** Draw the line OA' to represent a ray in water from O passing through A'. Using the information you gained in **(b)**, draw a line to show the path of the ray in air after it passes through the point A'. Mark your diagram in such a way as to show how you found the direction of the ray in air. [1]

**(d)** Take measurements to calculate the following ratio.

IR : OC = …… : 1

Record your measurements and show your working.

IR : OC = …… : 1 [2]

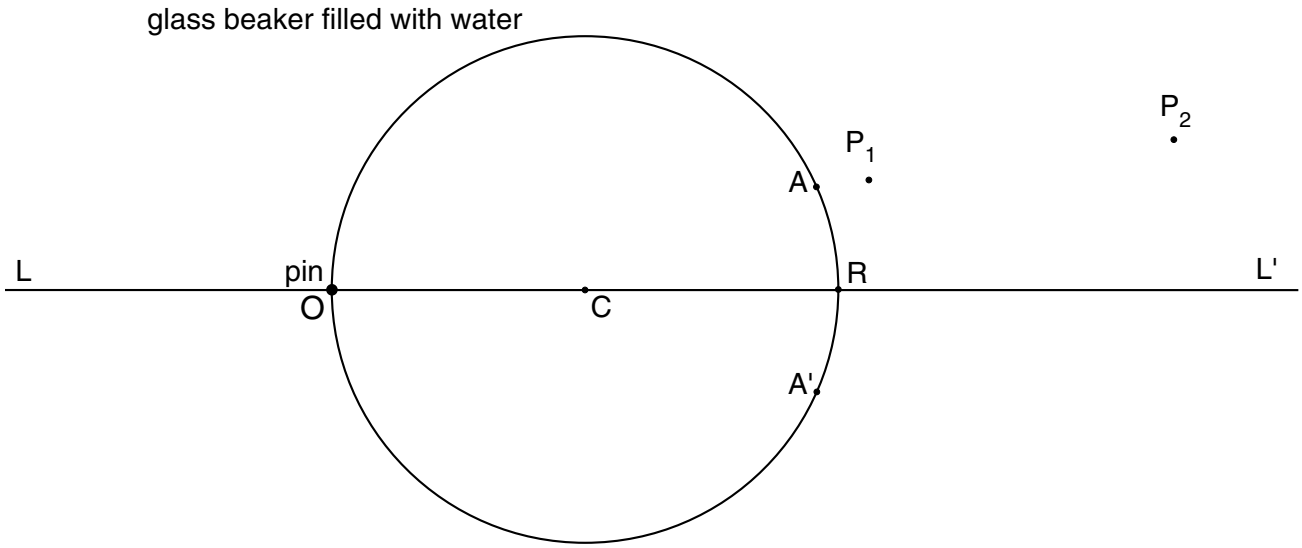


**Fig. 1.1**

**2** When investigating the magnetic field due to a bar magnet, a student places the magnet on a sheet of paper as shown in Fig. 2.1, on page 5. The edge of the paper is placed so that it is parallel to the direction of the Earth's magnetic field. The bar magnet is then placed as shown so that it is at right angles to the direction of the Earth's magnetic field. (In Fig. 2.1, the lines OX and OY are perpendicular to each other.) A small plotting compass is used to investigate the magnetic field.

**(a)** It is found that there are positions where the small magnet in the **plotting compass** points so that it is parallel to the line OX. Some of these positions are located and are labelled A, B, C, D, E, F, G and H, as shown on Fig. 2.1. The positions shown in Fig. 2.1 also lie on straight lines that come from the centre of the bar magnet.

Describe how you would locate the position labelled A. Your answer should explain

**(i)** what you would do to help you judge when the small magnet in the plotting compass is parallel to OX,

**(ii)** how you would ensure that the small magnet of the plotting compass is not sticking,

**(iii)** what you would do so as to mark the point A on the radial line,

**(iv)** how you would avoid making a parallax error when locating the point A.

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.....[5]

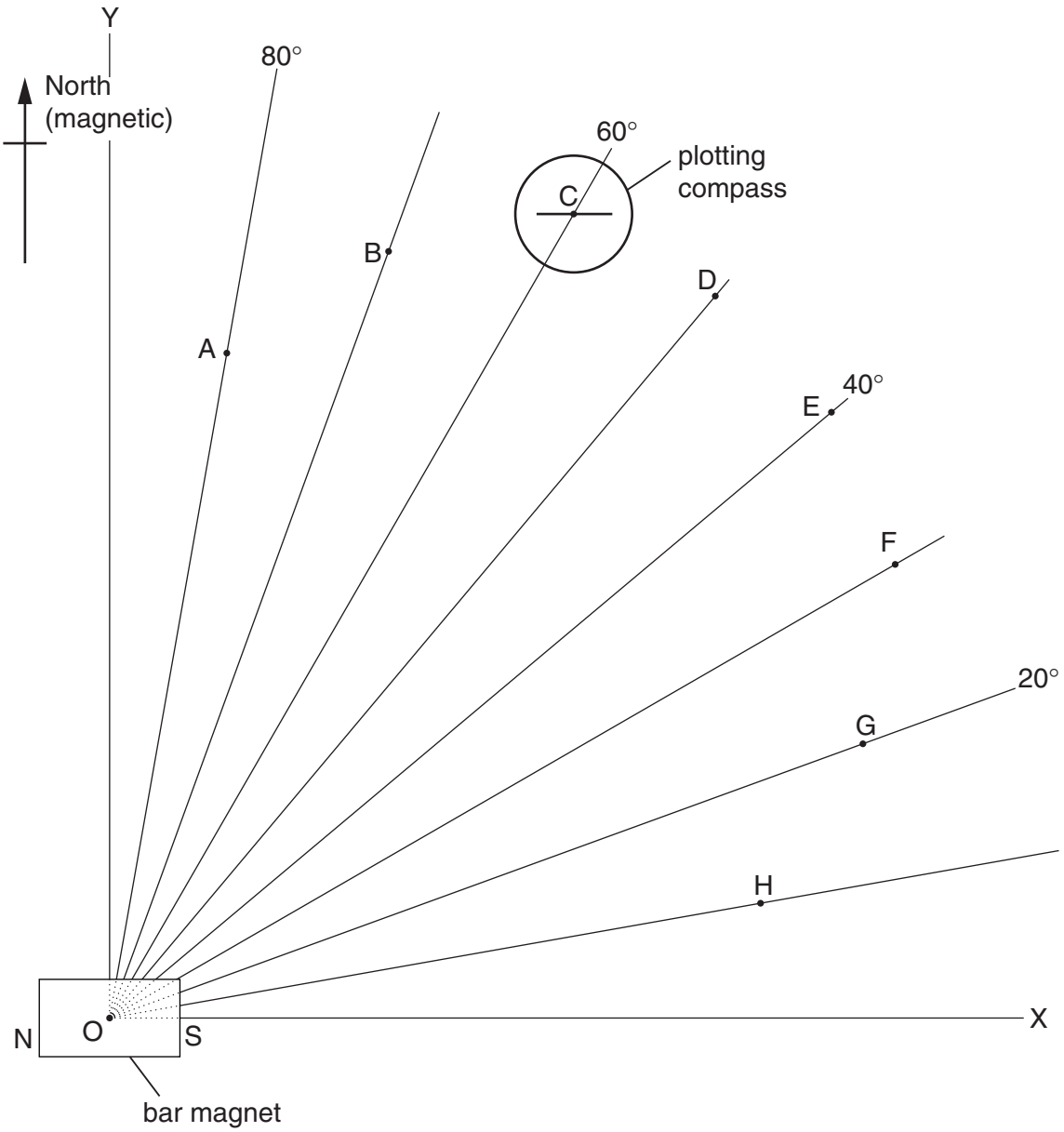


**Fig. 2.1**

**(b)** The plotting compass is at point C as shown in Fig. 2.1.

**(i)** Mark the plotting compass in such a way as to show which end of the small magnet of the plotting compass is a North pole.

**(ii)** The compass is at point C. It is then moved along the radial line so that it is closer to the bar magnet. Describe and explain what happens to the small magnet of the plotting compass.

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.....[3]

**3** Fig. 3.1 shows the top of a variable resistor that has a scale of resistance, which gives the resistance in use.

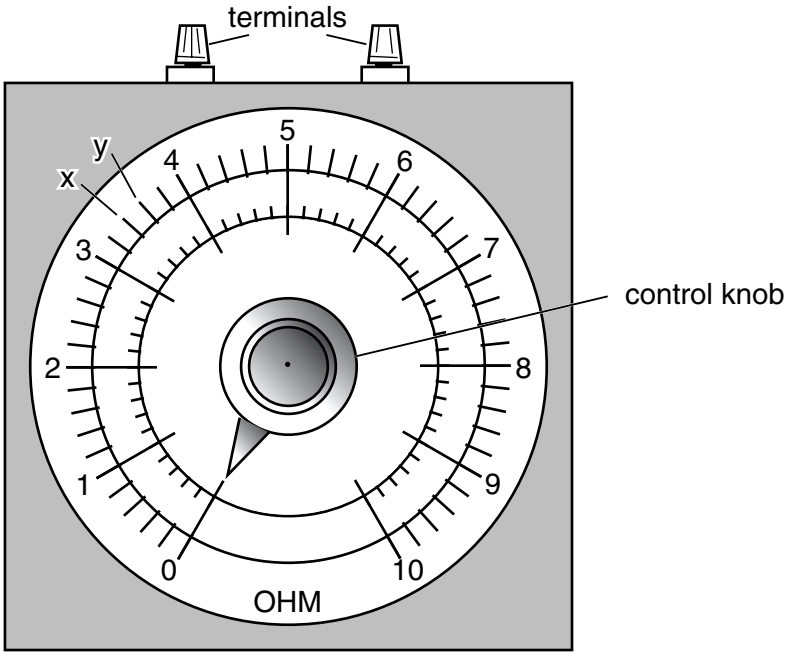


**Fig. 3.1**

**(a)** What range of values of resistance are available with this resistor?

range of values of resistance available = ..... [1]

**(b)** On Fig. 3.1, draw a line representing the position of the pointer when the value of the resistance in use is 6.3 Ω. [1]

**(c)** Between the numbers 3 and 4, there are two letters x and y.

**(i)** What is the resistance when the pointer is at x?

resistance at x = .....

**(ii)** What is the *change* in resistance when the pointer moves from x to y?

change in resistance = .....

[2]

**(d)** Draw the circuit symbol for a variable resistor.

[1]

**(e)** A student is asked to connect a circuit so that the current through a filament lamp can be changed by using a variable resistor.

The student makes a mistake when connecting the circuit.

Fig. 3.2 represents the student's **wrongly** connected circuit. (In this diagram the circuit symbol is not used for the variable resistor.)

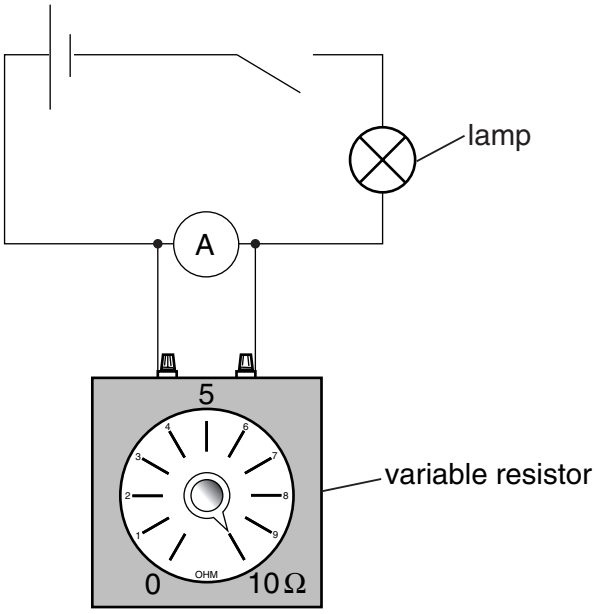


**Fig. 3.2**

When the variable resistor is varied from 10 Ω to 5 Ω, the **change** in the current is very small.

What could the student do to obtain a larger change in the current when the variable resistor is changed from 10 Ω to 5 Ω?

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.....[1]

**4** The apparatus shown in Fig. 4.1 is used in a heat experiment.

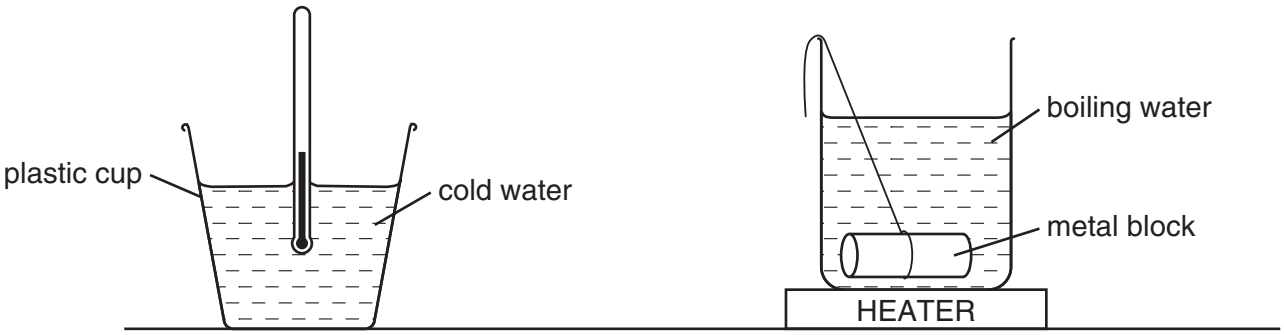


**Fig. 4.1**

A piece of metal at the boiling temperature of water is transferred to a mass of cold water. Initially, the cold water is at a temperature of $T_C$. The hot metal raises the temperature of this water to $T_H$. The rise in temperature, $\theta$, is determined from the relation $\theta = T_H - T_C$. The experiment is repeated so as to obtain five sets of readings for different masses of cold water.

**(a)** Draw up a table, for use in your laboratory notebook, in which you can record

$m$, the mass of cold water used,
$T_C$, the temperature of the cold water,
$T_H$, the maximum temperature reached by the cold water,
$\theta$, the rise in temperature of the cold water.

[3]

**(b)** Fig. 4.2 on page 9 is a graph showing how $\theta$ varies with $m$, the mass of cold water used.

**(i)** Why has a smooth line been drawn through the points?

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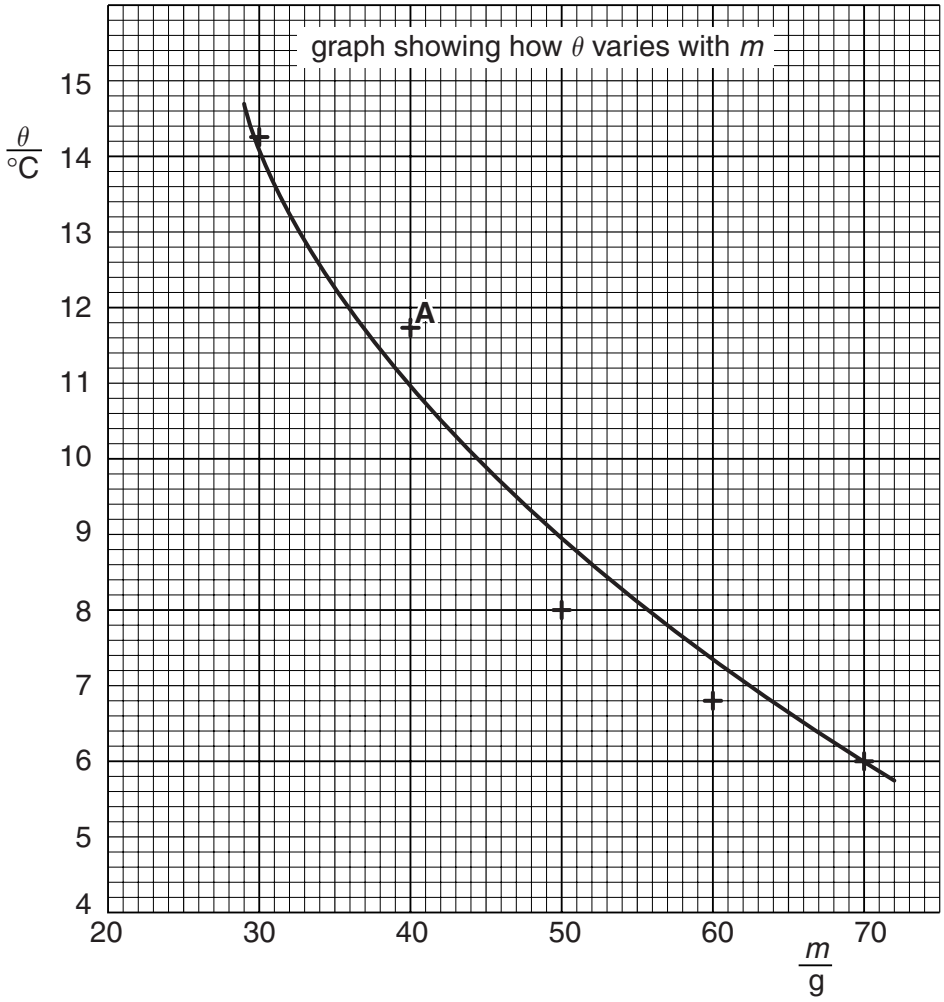


**Fig. 4.2**

**(ii)** The graph point that is labelled A does not lie on the graph line. (You can assume that the graph line is correctly drawn.) Complete the following statements about the value of $\theta$ and of $m$ at the point A.

1. If the value of $\theta$ were ..... °C smaller, the point A would lie on the line.

2. If the value of $m$ were ..... g smaller, the point A would lie on the line.

**(iii)** In **(ii)** above which is the most likely reason, 1 or 2, for the point A not being on the line? Give a reason for your choice.

choice: Tick **one** box.

☐ 1.

☐ 2.

reason:

.....

.....[4]

**5** The class is investigating the use of nichrome (resistance) wire instead of thin thread as part of a simple pendulum. The apparatus is shown in Fig. 5.1.

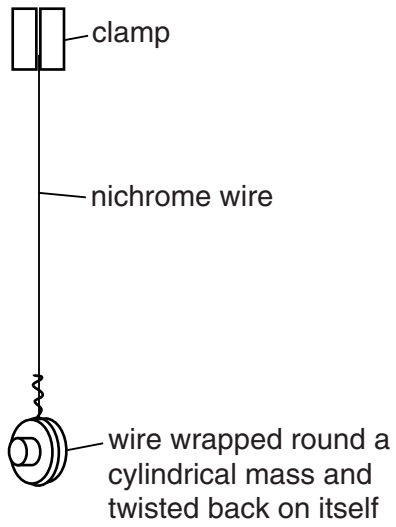


**Fig. 5.1**

Four tests are carried out.

Test A using very thin cotton thread for the suspension, (this thread is considered to have a negligible diameter).

Tests B, C and D in which nichrome wires of different diameters, *d*, are used.

In each test the length of the pendulum is 30.0 cm. The period, *T*, is determined by obtaining the total time, *t*, of a suitable number of oscillations. The period is given by $T = t/N$, where *N* is the number of oscillations.

The table gives the measurements taken by the class.

| test | suspension | *d*/mm | *N* | *t*/s | *T*/s |
|---|---|---|---|---|---|
| A | cotton thread | negligible | 50 | 54.8 | |
| B | nichrome wire | 0.31 | 50 | 53.4 | |
| C | nichrome wire | 0.56 | 50 | 50.3 | |
| D | nichrome wire | 0.91 | 50 | 43.3 | |

**(a)** For each test, determine the value *T* and record it in the table. [1]

**(b)** Suggest why 50 oscillations are used.

.....[1]

**(c)** **(i)** Plot a graph of *T*/s (*y*-axis) against *d*/mm (*x*-axis ). Start the *T*/s axis at *T*/s = 0.7. Draw a neat thin curved line through the four points.

**(ii)** Label each plotted point with the correct test letter A, B, C or D.

**(iii)** Describe how the values of $T$ change when the values of $d$, the diameter of the wire, decrease.

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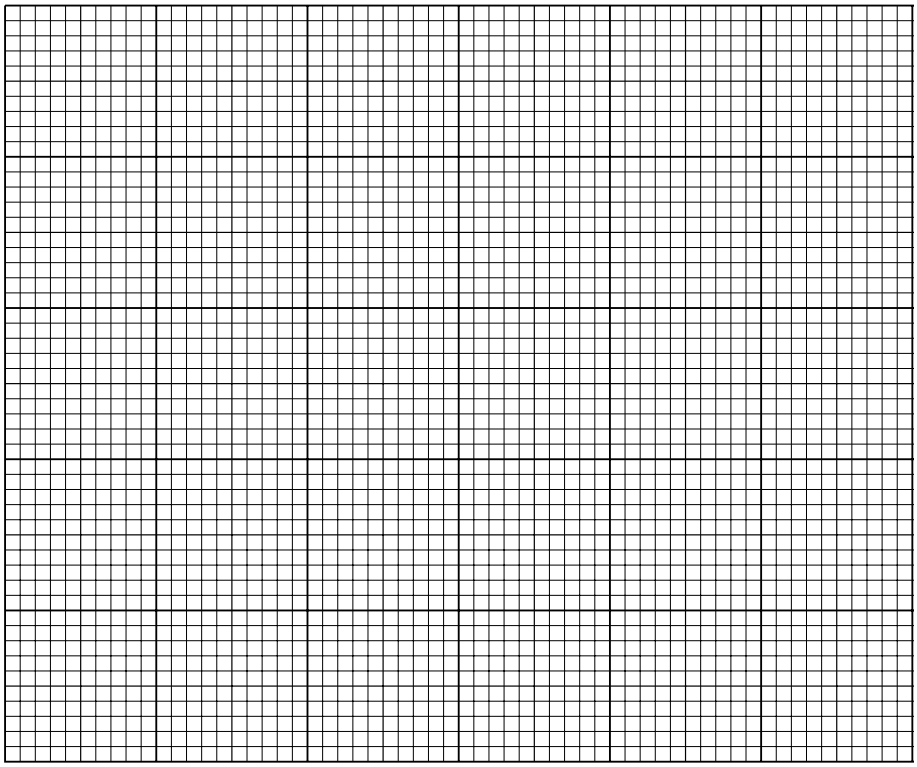
.....[7]



**(d)** In the laboratory you have enough time to take another set of measurements for one other value for the diameter of the nichrome wire. Study the shape of your graph line and then suggest an approximate value for the diameter that you think should be used. Give a reason for your choice.

choice for the value of $d$ = ..... mm

reason for this choice

.....

.....

.....[2]

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